4/11/2015

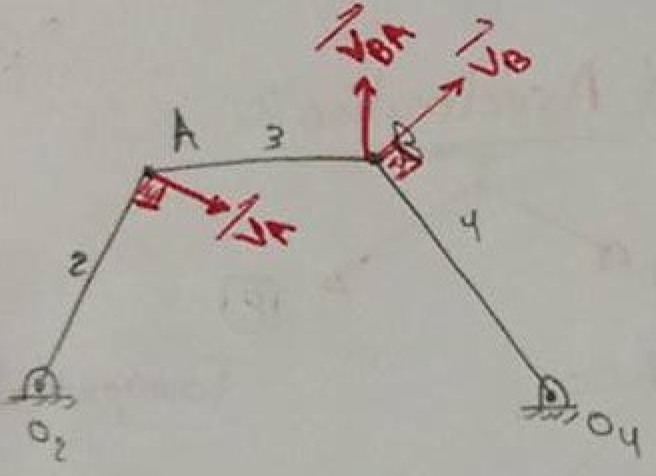
محاضرة ٥ نظرية ماكينات

AMR M.r

(9)

Acceleration Analysis

- Velocity : $\vec{V} = \frac{dx}{dt}$ (m/s)
- Acceleration : $\vec{A} = \frac{dv}{dt} = \frac{d}{dt}\left(\frac{dx}{dt}\right) = \frac{d^2x}{dt^2} \longrightarrow (m/s^2)$



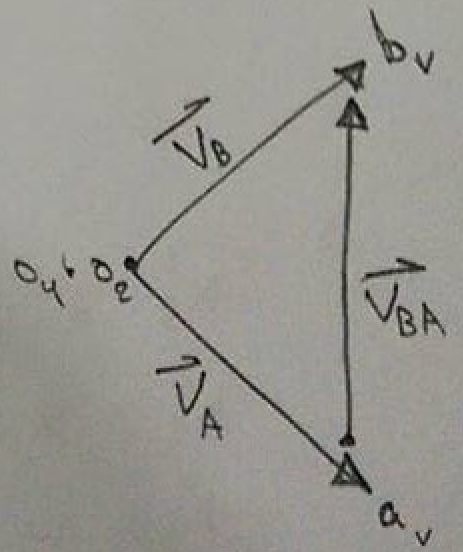
volicity polygon diagram.

$\vec{V_A} = \overline{O_2A} * w_2 \rightarrow (\perp O_2A)_A , w_2)$

$\vec{V_B} = (\perp O_4B)_B , w_4)$

$\vec{V_{BA}} \rightarrow (\perp BA)_A)$

scale



$\vec{V_B} = o_v b_v * \text{scale} =$

$\vec{V_{BA}} = a_v b_v * \text{scale} =$

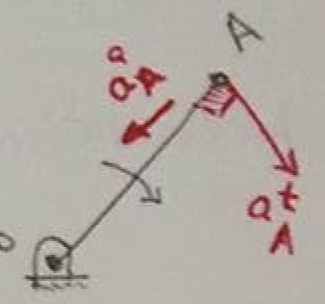
$w_4 = \frac{\vec{V_B}}{O_4B} = \text{---} \ \text{rad/s}$

$w_3 = \frac{\vec{V_{BA}}}{BA} = \text{......} \ \text{rad/s}$

$\boxed{6}$

$$\vec{V_B} = \vec{V_A} + \vec{V_{BA}}$$

$$\underset{\downarrow \atop (A^n_B + A^t_B)}{\vec{A_B}} = \underset{\downarrow \atop (A^n_A + A^t_A)}{\vec{A_A}} + \vec{A_{BA}} \searrow (A^n_{AB} + A^t_{AB})$$



Acceleration

$\boxed{1}$ Normal Acc.

(Radial Acc.)

(A^n)

$\boxed{2}$ Tangential Acc.

(A^t)

$$\vec{A^n} = w^2 R$$

$$\vec{A^n} = \left(\frac{V}{R}\right)^2 \cdot R$$

$$\vec{A^n} = \frac{V^2}{R}$$

$$A^t = \alpha \cdot R$$

ليس من الضرورة أن يكون إتجاه α هو نفس
إتجاه ω ← وذلك في حالة العجلات التناقصية

$$A^n_B = w_4^2 * O_4B = \surd\surd \quad rad/s$$

$$A^t_B = \alpha \cdot R$$

$$A^n_A = w_2^2 * O_2A = \surd\surd$$

$$A^t_A = \alpha_2 * O_2A = \surd \longrightarrow (\text{IF } w_2 = \text{const.} \therefore \alpha_2 = \text{Zero})$$

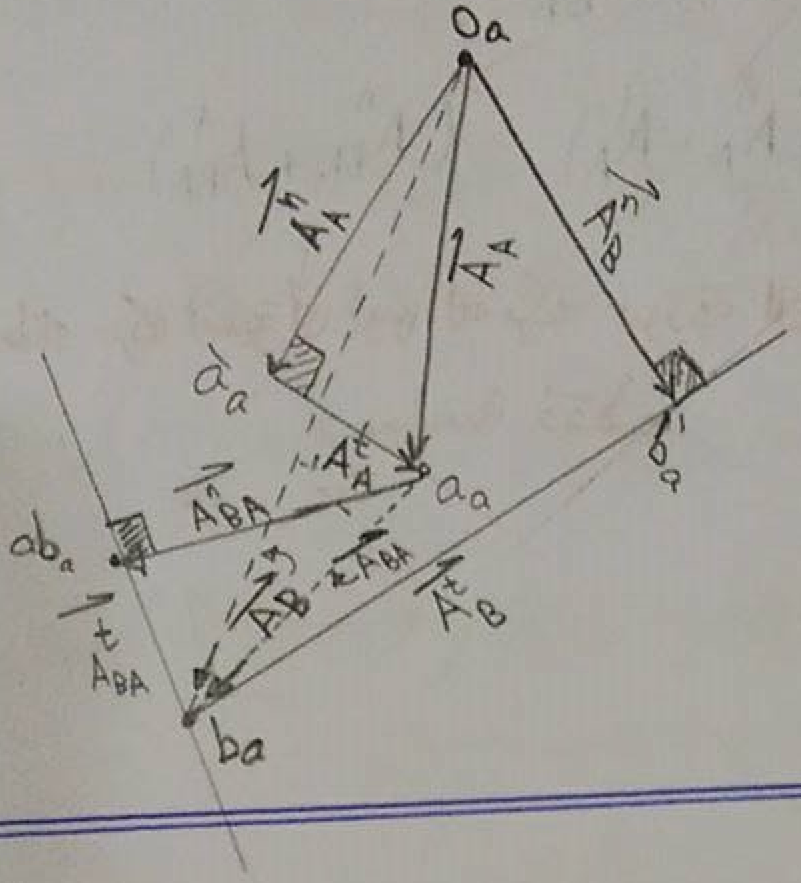
$$A^n_{BA} = w_3^2 * BA = \surd\surd$$

$$A^t_{BA} = \alpha_3 \cdot BA = \surd$$

C

Acceleration polygon

(scale ma): 1cm = ---- m/s^2



Acceleration analysis

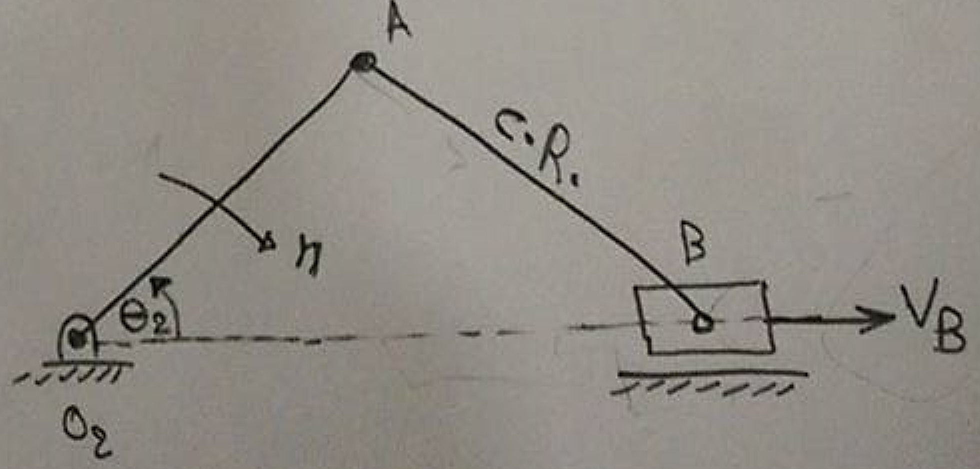
slider crank Mechanism. (s.c.M)

m_L: O_2A

AB

O_2B

θ_2



solution

① velocity Polygen.

$\vec{V_A} = \omega_2 * O_2A \rightarrow (\perp O_2A)$

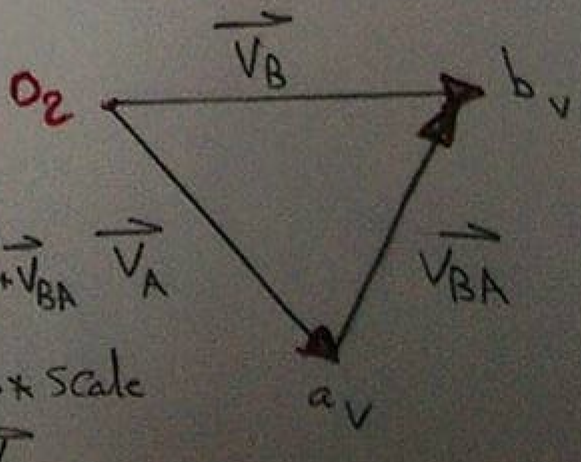
$\vec{V_B} \rightarrow$ (H. to Right)

$\vec{V_{BA}} \rightarrow (\perp BA_B)$

$\vec{V_B} = \vec{V_A} + \vec{V_{BA}}$

$\vec{V_B} = o_v b_v * \text{scale}$

$\vec{V_{BA}} = \vec{V_B}$



report

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Prob : Figure below shows the mechanisim of a moulding press in Drawing

oA = 80 mm , BA = 320 mm , Bc = 120 mm BD = 320 mm

The vertical distance of oc is 240 mm and horizental distance of oD is 160 mm - when crank oA rotates at 120 rpm (aniclockwise) determin :-

the acceleration of D and angules acceleration of the link cB.